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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/370,508	08/06/1999	UMESH SHARMA	20944.9000	8186

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EXAMINER	
DEO, DUY VU	

ART UNIT	PAPER NUMBER
1765	11

DATE MAILED: 05/10/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/370,508	SHARMA ET AL.	
	Examiner	Art Unit	
	DuyVu n Deo	1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 March 2002* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-10 and 14-32* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *1-9* is/are allowed.

6)☒ Claim(s) *10, 14-32* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 18, 25, 26, 32 is rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Referring to claims 18, 26, the specification doesn't describe removing the ARC without applying an oxide between the formation of the ARC and the removal of ARC. The specification describes the ARC comprises of oxide and oxynitride layers. It is unclear how the ARC is removed, without formation of the oxide layer between the formation of the ARC and the removal of ARC, when the ARC also comprises of oxide layer.

Referring to claims 25, 32, the specification doesn't describe the ARC is removed before subjecting the ARC to a T greater than about 400 degrees Celsius. The specification describes the ARC comprises of oxide and oxynitride layers and it describes only the oxynitride is removed before subjecting the ARC to a T greater than about 400 degrees Celsius.

At this time, the ARC will be understood as the oxynitride layer only.

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 19 and 27 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

It is unclear how the ARC is removed, without formation of the oxide layer between the formation of the ARC and the removal of ARC while the ARC also comprises of oxide layer. At this time, the ARC will be understood as the oxynitride layer only.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) do not apply to the examination of this application as the application being examined was not (1) filed on or after November 29, 2000, or (2) voluntarily published under 35 U.S.C. 122(b). Therefore, this application is examined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

6. Claims 26-28 are rejected under 35 U.S.C. 102(e) as being anticipated by Adkisson et al. (US 6,030,541).

Adkisson teaches a method of forming a semiconductor device comprising: depositing an oxide layer from TEOS of about 100-1000 angstrom; depositing an oxynitride layer using SiH4 and N2O (claimed ARC) of about 100-2000 angstrom over the oxide layer; depositing a resist pattern over the oxynitride; patterning the oxide layer (claimed patterning the substrate to form a stack); removing the oxynitride by using phosphoric acid (col. 3, line 50-col. col. 5, line 50). This embodiment of Adkisson shows that the oxynitride (or the ARC) without applying an oxide between the formation and removal of the oxynitride.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. Claims 10, 14, 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Adkisson et al. (US 6,030,541) and Wolf et al. (Silicon Processing for the VLSI Era, Vol.1).

Adkisson teaches a method of forming a semiconductor device comprising: depositing an oxide layer from TEOS of about 100-1000 angstrom; depositing an oxynitride layer of about 100-2000 angstrom over the oxide layer; depositing a resist pattern over the oxynitride; patterning the oxide and the oxynitride layer; removing the oxynitride by using phosphoric acid (col. 3, line 50-col. col. 5, line 50). Unlike claimed invention, Adkisson doesn't describe removing the oxynitride before the oxynitride is subjected to any temperature greater than about 400 degrees Celsius. Since Adkisson teaches the same steps as that of claimed invention and it is

conventional that the processing of photoresist is done with T that is under 400 degrees Celsius, ass evident supported by Wolf (pg 429-455, pg 518), the method would inherently not having any step that would subject the silicon oxynitride to any temperature greater than about 400 degree Celsius between the deposition and removing the oxynitride layer.

9. Claims 18, 19, 23, 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Adkisson and further in view of Lee (US 5,620,913).

Unlike claimed invention, Adkisson doesn't describe forming an interpoly dielectric and a second poly layer. Lee describes a method for forming a flash memory comprising the steps of forming an interpoly dielectric, including a nitride layer, and a second poly layer (col. 5, line 55-col. 6, line 10). It would have been obvious for one skill in the art to modify Adkisson's method in light of Lee's teaching because Adkisson teaches a method for defining a pattern in the surface and his invention can be applied to other and different embodiments (summery) and one example of other structures is taught by Lee in order to form a flash memory cell with an anticipation of an expected result.

10. Claims 15-17, 20-22, 29-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Adkisson, Adkisson/Wolf, or Adkisson/Lee as applied to claims 14, 19, 27 above, and further in view of Cheung et al. (US 5,968,324).

Cheung teaches a method of forming oxynitride using SiH4 and N2O wherein the ratio between them is about 1.0 and Cheung further teaches that the refractive index, absorptive index, and thickness for different wavelengths can be controlled by varying the parameters and the rate

at which the gases are introduced (col. 3, line 1-5; col. 4, line 1-33). It would have been obvious at the time of the invention for one skill in the art to deposit the oxynitride in light of Cheung because Cheung further teaches controlling the parameters for the deposition of the oxynitride that is used by above Adkisson in order to control the refractive index, the absorptive index, and the thickness of the oxynitride.

11. Claims 24, 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Adkisson or Adkisson/Lee as applied to claims 18, and 26 above, and further in view of Fu et al. (US 6,245,682).

Referring to claims 23, and 31, etching the oxynitride using hot phosphoric acid is well known to one skill in the art. Fu teaches etching the oxynitride using hot phosphoric acid (100-150 degree Celsius) (col. 5, line 23-31). Therefore, it would have been obvious for one skill in the art to modify above prior art in light of Fu because these condition would etch the oxynitride faster than the under oxide layer as taught by Fu.

12. Wolf is cited to show that RIE of insulator (such as silicon oxide) is known and available to one skill in the art (pages 539-542).

Response to Arguments

13. Applicant's arguments with respect to claims 1-10, 14-32 have been considered but are moot in view of the new ground(s) of rejection.

14. Applicant's arguments filed 3/5/02 have been fully considered but they are not persuasive.

Referring to applicant's argument that Adkisson also teaches oxidizing the top surface of the oxynitride in order to prevent poisoning or acidification from the photoresist is acknowledged. However, he suggests that this oxide may be formed. It means that it is not necessary to have this oxide layer as shown here in his embodiment of figure 3. Furthermore, the oxide layer, if it is formed, can be formed by CVD, and according to page 8 of the invention specification, it is known to one skill in the art that the oxide layer, formed by the CVD, is at a low T, less than 400 degree Celsius.

Allowable Subject Matter

15. Claims 1-10 are allowed because Adkisson doesn't describe pattern etching the oxide layer, the oxynitride layer, the layer of poly, and the silicon nitride layer and then removing the remaining layer of the oxynitride. Adkisson teaches of removing the remaining of the oxynitride layer before etching the poly layer to avoid disrupting the poly gate structure material.

16. Any inquiry concerning this communication or earlier communications from the examiner should be directed to DuyVu n Deo whose telephone number is 703-305-0515.

DVD
May 9, 2002

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